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Metaphors and the Market:

Consequences and Preconditions of Agent and Object Metaphors in Stock Market

Commentary

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Abstract

We investigated two types of metaphors in stock market commentary. *Agent* metaphors describe price trends as volitional actions, whereas *object* metaphors describe them as movements of inanimate objects. Study 1 examined the consequences of metaphoric description for the investor audience. Agent metaphors, compared with object metaphors and non-metaphoric descriptions, caused investors to expect price trend continuance. The remaining studies examined preconditions, the features of a trend that evoke agent versus object metaphors. We hypothesized that the rate of agentic metaphors would depend on the trend direction (upday vs. downday) and steadiness (steady vs. unsteady). Two archival studies tracked the metaphoric content in end-of-day CNBC commentary as a function of daily price trajectories. As predicted, agent metaphors were more likely for uptrends than downtrends and especially so when the trends were relatively steady. This held for both bull (Study 2) and bear market periods (Study 3). Study 4 replicated these findings in a laboratory study where participants took the role of a stock market commentator.

Keywords: Stock Market, Metaphor, Agent, Attribution, Prediction, Media, Trajectory

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Commentary

In recent years, a broad stream of research has analyzed the cognitive psychology of investors. Patterns of behavior that defy rational models have been elucidated by identifying the heuristics with which naïve investors process financial information (e.g., Barberis & Thaler, 2003; Camerer, 1987; Fong & Wyer, 2002; Nelson, Bloomfield, Hales, & Libby, 2000). Yet investors do not make judgments in a social vacuum. Recent behavioral finance evidence suggests they are influenced by other people's comments about the market—not just those of other people they know (Hong, Kubik, & Stein, 2003) but also those of the market commentators they read (Huberman & Regev, 2001, Liang, 1999) and watch on television (Busse & Green, 2002). This suggests a need to understand the behavior of investors in conjunction with that of market commentators.

The current research takes up this challenge by focusing on metaphoric language in market commentary. We use metaphor in the broad Aristotelian sense as speaking about an event in terms transferred from another domain (Heath, 1996). Whereas literary scholars focus on the *poetic* metaphors used for expressive effect, cognitive scientists have studied the *conventional* metaphors that people use to speak and think about abstract events in more concrete terms (Lakoff, 1993). Notwithstanding their occasional poetic moments, stock market commentators primarily use conventional metaphors. Past analyses of stock market metaphors have identified examples of conventional metaphors that occur in newspaper stock market reports across three different languages (Schmitt, 2002). Some are explicit comparisons of a market movement to a

“charging bull,” a “falling javelin,” or to the bounce of a “dead cat.” Yet most are implicit comparisons, as when market trends are described in terms that connote animate (“climbed”) or physical (“bounced”) dynamics.

To go beyond merely listing market metaphors, we propose two basic types that draw on different domains of schemas. Evidence from various fields of cognitive science (Pinker, 1997) suggests that humans have particularly rich and fluent schemas for interpreting movements in two domains: 1) the actions of animals and people, and 2) the movements of inanimate objects such as rocks or tools. We propose that two basic types of market metaphors result from the imposition of these two schema domains, namely: *Agent* metaphors describe price activity as action, as the volitional, internally-driven behavior of an animate entity. Some examples of agent metaphors are “the Nasdaq climbed higher,” “the Dow fought its way upward,” and “the S&P searched for a bottom.” *Object* metaphors describe price fluctuations as object trajectories, as movements of inanimate objects determined by external physical forces. Examples of this second category are “the Nasdaq dropped off a cliff,” “the Dow fell through a resistance level,” and “the S&P bounced back.”

Our goal is to identify distinctive antecedents and consequences of these two types of market metaphors. The antecedents issue concerns the psychology of the market commentator faced with the task of describing a market trend. What kinds of price trends evoke these types of metaphor in the commentator’s thoughts and words? The consequences issue concerns the psychology of the investor making judgments about the market. How does metaphoric description in market commentary *matter*, in the sense that it changes the judgments of the investors who have been exposed to it. Our hypotheses about these questions follow from what is known about the two kinds of schemas. For instance, schemas for interpreting action carry a

bias toward exaggerated expectations that observed trends will continue (Heider, 1958; Ross & Nisbett, 1991). If these schemas underlie agent metaphors, then the same bias should result with regard to the market. That is, investors exposed to agent metaphors for a market trend, and encoding the trend in terms of this metaphor, should exhibit exaggerated expectations that the observed trend will continue in the future.

Before deriving our hypotheses more systematically, it is worthwhile to review some basic features of the research setting: the stock market, the journalists who cover it, and their audience of investors. After introducing this setting, we develop our argument concerning the distinctive consequences of commentary featuring agent metaphors as opposed to object metaphors or no metaphors. The next section then develops our argument concerning the distinctive antecedents—the price trends that evoke each type of metaphor.

The Stock Market Setting

It is well established in economics that day-to-day trends in the stock market follow a random walk, meaning that today's trend does not predict tomorrow's trend (Malkiel, 1996). Nevertheless, investors form expectations about short term market trends and trade on them. Research tracking portfolios of investors finds that the more they trade actively—trying to time the buys and sells in relation to short-term trends—the worse their overall returns (Barber & Odean, 2000). If not the experience of success, what then makes investors confident that they can interpret and predict short-term trends? One contributor, we suggest, may be market commentary.

The trouble is that commentators do not merely report market trends but also explain them. Consider, for instance, the tagline of the show *CNBC Marketwatch*: “The story behind the numbers.” Under this billing, commentators cannot report an increase or decrease or say “it was

another random walk today.” They are supposed to provide their audience with a *story*--an explanation of *why* the market moved the way it did. While attributions for today’s trend undoubtedly makes the commentary more entertaining and satisfying, they may instill unwarranted expectations about tomorrow’s trend. Past research on this connection has focused on indirectly stated attributions. Market commentators generally avoid direct “because” statements (which would be hard to defend); instead they convey attributions indirectly, such as through juxtaposing price-change information with news of changed business conditions (e.g. “GM rose 3 points today on news of a strike settlement.”). In a stock trading game, Andreassen (1987) manipulated whether or not such “news” followed the price change information, and he found that news led participants to perform worse. News-condition participants bought (high) after updays and sold (low) after downdays, presumably because they attributed trends to enduring conditions and hence expected the trends to continue. Recently, DiFonzo and Bordia (1997, 2002) found the same effect from exposing investors to indefinite “rumors” rather than definite news, which ruled out alternative accounts of the effect in terms of the information-value of news. Taken together, these studies highlight that investors are susceptible to attributional messages in stock commentary. Even though commentators do not directly assert cause-and-effect, their indirect explanatory references to changed business conditions shape their audience’s attributions and expectations.

Aside from explanatory references to news or rumors of changed business conditions, there may be other ways that commentators intentionally or unintentionally convey causal attributions. Even without hazarding a reference to business conditions, commentators may provide hints about the causes of price trends through metaphoric language. Agent metaphors (“The Nasdaq climbed higher”) imply that the movement reflects an internal purpose or

disposition and hence may suggest that that the movement is likely to continue. By contrast, object metaphors (“The Nasdaq was pushed higher”), do not imply that a movement reflects an enduring internal force. This is the crux of our argument--that exposure to agent-metaphor descriptions affects investors differently from object-metaphor or non-metaphorical descriptions of price trends. To develop the argument in more detail we turn now to the psychological literature on metaphoric language and metaphoric encoding.

Distinctive Consequences

In considering the consequences of metaphors, it is worth distinguishing metaphoric description (using terms from another domain to talk about an event) from metaphoric encoding (using schemas from another domain to think about an event). Psycholinguistics research finds that a writer’s metaphorical descriptions prime the reader to encode the event in terms of the schemas from a different domain (Galinsky & Glucksberg, 2000; Gibbs, Bogdanovich, Sykes, & Barr, 1997; Slobin, in press). For example, in one experiment exposure to particular metaphors for love (e.g. love is a journey) made participants more likely to answer questions about love in ways consistent with the metaphor during a subsequent task (Gibbs, 1992).

It is perhaps not surprising that the metaphors people read affect the metaphors they subsequently speak, but do metaphoric encodings also guide the way people make practical judgments? Striking corroboration of this question has come from studies of the metaphoric mental models people use when reasoning about technology. For instance, a high fraction of Americans believe that their home thermostat works like a gas pedal (they model it as a valve rather than a switch) and, accordingly, engage in the erroneous tactic of turning it to higher-than-desired temperatures in order to heat the house more quickly (Kempton, 1987). Consequences of metaphoric encodings have also been documented with experienced practitioners: electricians

make different patterns of mistakes on wiring problems depending on which of two conventional metaphors they use to model electricity --the metaphor of flowing water in pipes or teeming crowds in corridors (Gentner & Gentner, 1983). The two metaphors bring different schemas to the electricity problem, and each respective schema carries its own distinctive biases.

Now let us return to agent versus object metaphors in stock commentary and their consequences for investors. We propose that these reflect different causal schemas. An axiom of attribution theory (Heider, 1958) is that schemas for personal causality differ from those for physical causality. Whereas the perceiver's causal schemas for interpreting object motion trace movements to transitory, external physical forces, the perceiver's causal schemas for interpreting action traces the observed act to enduring, internal properties and hence give rise to expectations that observed trends will continue. Studies of people's judgments about actors show such the bias toward continuance expectancies. Observers of social behavior over-predict the degree to which the target's future behavior will be consistent (Ross & Nisbett, 1991). Likewise, observers of sports performances trace observed trends to internal properties of the actor ("the hot hand") and consequently over predict continuance of the performance (Gilovich, Vallone, & Tversky, 1985).² As in the social and sports domains, we propose that agent schemas will affect expectancies in the stock domain. More formally, we propose

H1: The presence of agent metaphors in commentator descriptions of a price trend influences the judgments of their investor audience, making investors more likely to expect that the given trend will continue than they would be otherwise.

The first hypothesis suggests that commentators' metaphoric descriptions beget corresponding metaphoric encodings in the minds of their investors. Yet are there some conditions where investors are less susceptible to encodings? Metaphor research, for instance, has found that

people can inhibit activation of the literal meanings of metaphors when they are made conscious that figurative language is being used (Galinsky & Glucksberg, 2000). A possibility is suggested by Lakoff's (1993) argument that the groundwork for many conventional metaphors is the mapping of abstract quantities into spatial positions (e.g. more is up), so abstractions become more like perceptions. Lakoff (1993) contends that the stock chart is an artifact that reifies a spatial mapping of price movements into trajectories, and that representing a trend as a spatial trajectory fosters its interpretation in terms of metaphors. Studies have found that particular action concepts are associated with particular kinds of dynamic trajectories (Michotte, 1946) and even with static trajectory-like diagrams (Richardson, Spivey, Barsalou, & McRae, 2003). This suggest that investors might be less likely to encode a price trend in terms of agent metaphor ("climbed" or "searched") if they receive priced information not in the customary chart but rather in a table of numbers. Hence, a qualification of the prior generalization is

H2: The effect of agent-metaphor commentary on continuance judgments will be reduced when price trends are presented as a table of numbers rather than a trajectory-like chart.

Distinctive Antecedent Conditions

If agent and object metaphors produce different consequences, then it is important to identify the antecedent conditions that give rise to them. Our argument about the eliciting conditions for these types of metaphors, again, turns on the premise that they reflect the activation of two different causal schemas. A longstanding finding is that specific trajectory features in stimulus displays automatically evoke processing in terms of schemas for animate action (Heider & Simmel, 1944) as opposed to inanimate mechanics (Michotte, 1946). In general, it is trajectory features that are highly diagnostic of whether something is animate as opposed to inanimate in the natural environment that activate the respective schemas. In the

natural environment, things that ascend are almost invariably animate, whereas descending things have a tendency to be inanimate. Hence, we might expect an upward moving stimulus trajectory would activate animacy schemas and a downward trajectory would activate inanimacy.

To consider what this suggests about the preconditions for metaphoric language about price trends, we turn to a pilot study by Andreassen (1987) that sampled references to economic conditions to explain price changes in individual stocks in a *Wall Street Journal* column in selected years. Though not the focus of his analysis, Andreassen (1987, Table 1) presented the descriptions of the 5 most positive and 5 most negative daily price changes from his sample. In other words, these were days when a stock underwent a dramatic uptrend or a dramatic downtrend. The descriptions of price up-trends (date shown) were:

(6/3/1980) “Financial Federation *leaped...*”

(4/12/1960) “United Stores second preferred lead the market in activity, *advancing...*”

(8/20/1965) “Americian South African Investor *rose....*”

(11/3/1970) “In the glamour group, Telex *climbed...*”

(6/2/1980) “ERC Corp. stock *soared...*”

The descriptions of down-trends, by contrast, were:

(11/20/1975) “Marine Midlands Banks *slid...*”

(6/20/1980) “City Investing was the Big Board’s most active stock, *dropping...*”

(4/1/1960) “Polaroid *plummeted...*”

(4/20/1960) “The most active stock was Ampex, which *dropped...*”

(11/4/1975) “A big casualty among blue chips was United Technologies, which *fell...*”

Notice first that there is a lot of metaphoric language in the description of these dramatic uptrends and downtrends, some agent metaphors referencing internal force (“leaped” and “climbed”) and some object metaphors referencing external physical forces such as gravity (“plummeted” and “fell”). Yet more importantly, notice that two metaphor types are not randomly distributed with respect to vertical direction of the trend: agent metaphors are evoked by up-trends whereas object-metaphors are evoked by downtrends.

We propose that people associate upward trajectories with animacy, because of experience in a natural environment in which ascending is diagnostic of animacy. People may acquire the association through learning from direct experience in the environment. Based on the law of cognitive structure activation, their schemas for animates and action would come to be activated by the stimulus of an upward trajectory or trend (Higgins, 1996; Sedikes & Skowronski, 1991). Relatedly, Schubert (2005) finds that perceivers’ associate higher positions in space with social status. Because of perceivers’ experience in a world where heights is diagnostic of status, highness becomes a stimulus feature that automatically activates concepts for status.

Alternatively or in addition to learning from experience, the mental link between ascending trajectories and animacy may be related to hardwired neural mechanisms. Humans have evolved to pick up regularities in the natural environment (Leslie, 1995). Responses to trajectories are hardwired in many species; the frog, for example, protrudes its tongue in response to stimulus displays that resemble the zig-zagging trajectories of flies (Lettvin, Maturana, McCulloch, & Pitts, 1959).⁴ Increasing evidence suggests that humans are hardwired to distinguish animate, goal-directed movement from object movement. Stimulus displays in which a moving shape ascends off of the ground plane to surmount an obstacle are processed as

action, even by infants who have had little opportunity to learn from experience (see Scholl & Tremoulet, 2000). Mechanisms to recognize animates as opposed to inanimates based on trajectories would have been adaptive for hunter - gatherers, and so they may be built-in to the human brain.

Yet--regardless of its source in nature, nurture, or their interplay--the ascending-animate link should come into play when people are exposed to price trajectories as well as the trajectories of actual moving objects. This means that updays should evoke schemas for animate action and downtrends, schemas for inanimate motion. Hence, upward trends should be more likely to be described in terms of agent metaphors, and downward trends should be more likely to be described in terms of object causality.⁵ A main effect hypothesis about metaphor evocation, then, is as follows:

H3: The more upward the direction of price trends, the higher will be the rate of agent metaphors and the lower, the rate of object metaphors in market commentary.

Is direction the only relevant feature of trajectories in determining the schema activation and metaphoric description that they evoke? In addition to the trend direction, another salient feature of price charts is the unsteadiness of the trend, which reflects whether there was volatility in the price in addition to any directional change. We propose that unsteadiness dampens the impact of the overall trend direction. Again, our analysis is that this reflects that unsteadiness, in combination with direction, is diagnostic of animacy in the natural environment.

To see this, consider the contrast between two upward trajectories: (1) something in the distance ascending steadily from the ground into the sky, and (2) something ascending on an unsteadily path, occasionally dropping downward before resuming upward. The first one gives a stronger impression of agency because it is pure ascent (like a raptor taking flight) whereas the

second is a mixed of ascending and descending movements (like a leaf blowing in the wind). Now consider these two: (1) something sliding steadily down a distant mountain slope, and (2) something heading down a distant slope but with occasional uphill reversals. The unsteady descent shows some sign of agency in its reversals (it could be a skier who turns uphill now and then) whereas the steady descent shows no signs of life whatsoever (it is falling like a rock). Overall, this reasoning leads us to expect that the more unsteady a trend, the less its overall direction determines the activation of agency schemas and concomitant metaphors. Spelling this out, we propose

H4: In the context of uptrends, unsteadiness should decrease agent (and increase object) metaphor rates, whereas in the context of downtrends it should increase agent (and decreases object) metaphor rates.

Overview of Current Studies

In the current research, we first examined how metaphors affect lay judgment and then we investigated the conditions that elicit metaphors. Throughout all our studies, we focused on market indices (Dow, Nasdaq, and S&P)⁶ rather than individual stocks. A skeptic might argue that agentic descriptions of individual stocks (e.g. “Apple picked up its pace”) are references to their CEOs or employees, rather than being metaphors. Yet no one could argue that descriptions of a market index (“the Nasdaq picked up its pace”) refer to coordinated actions by all the employees of the hundreds of indexed firms. Hence, commentary about market indices, rather than about individual stocks, is more unambiguously metaphorical.

Study 1 investigated the consequences of commentator metaphors on investor expectancies of trend continuance. Participants took the role of investors and interpreted daily price trends in order to predict the next day’s trend. We manipulated whether or not they were

exposed to agent-metaphor descriptions of the current day's trend, and whether this trend was presented in a standard stock chart or in a table of numbers. We found, as hypothesized, that expectancies of trend continuance were higher in the agent-metaphor condition than elsewhere, yet this effect of the commentator's language was diminished when the price trends were presented numerically instead of graphically.

The remaining studies investigated the conditions that give rise to agent and object metaphors. Study 2 analyzed daily commentary about major indices in an end-of-market-day TV program on CNBC. By correlating metaphor content with the indices' daily financial performance, we found support for the hypothesized main effect of price trend direction and its interaction with a measure of price trend steadiness. Study 3 replicated these results in a different historical period. Study 4 replicated these relationships in laboratory experiment, which enabled direct manipulation of the price trajectories that participants (in the role of stock commentators) described. Importantly, this final study tested our account of metaphor evocation in terms of trajectory-cued schemas against an alternative account in terms of motivated reasoning.

Study 1

Our first study investigated the consequences of metaphoric commentary on the investor audience. We proposed that exposure to metaphoric description of a price trend affects naïve investors by making them more likely to encode the price trend metaphorically, in terms of schemas from the domain the metaphor references. Participants were given the task of studying one day's price activity and then predicting the next day's trend. They were presented detailed quantitative information about the price activity as well as a verbal statement by a market commentator.

The primary experimental manipulation was the content of the verbal commentary about

the given day's price activity. We tested whether agent-metaphor content, compared to object-metaphor content or non-metaphorical content, would give rise to stronger expectancies of trend continuance.

A second manipulated factor was the format in which the quantitative price trend information was presented--chart or table. The standard chart format represents price activity as a spatial trajectory and hence fosters encoding it in terms of action schemas. The table format was designed to convey precisely the same information as in the chart but in a format that emphasizes price as an abstract quantity, not as a position in space, and hence discourages encoding the trend in terms of action schemas. We predicted that the chart format would facilitate encoding of the price trend metaphorically. Hence, the format factor should interact with the metaphoric content factor.

This interaction-effect hypothesis is useful for distinguishing our account from an alternative account of why investors are affected by agent metaphors in stock commentary. A skeptic might argue that investors who read "the Nasdaq climbed higher" and then judge that the uptrend will continue tomorrow are not encoding the event metaphorically (in terms of schemas for volitional action); rather these investors are merely taking the commentator's agentic language as a positive signal of the commentator's conviction the trend is meaningful. If so then investors' increased predictions of trend continuance, after hearing agentic metaphors, might reflect a perfectly rational adjustment. However, if investors' response to agent metaphors reflects this rational signal-reading process, the effect should occur equally in the graph and table conditions. It is only our account, in terms of metaphoric encoding, that predicts the effect should be stronger when the trend is presented spatially in a graph than numerically in a table.

Method

Participants. Subjects were 64 undergraduates at Cornell University who participated in this study in exchange for \$5 compensation.

Procedure. Participants were given a questionnaire with instructions on the cover page followed by 6 pages presenting information about the performance of the Nasdaq index on a particular day, purportedly days drawn at random from the prior 5 years. The instructions explained that it was a study of predicting stock market trends. They would be given information about the intraday price variation of a stock index, along with a description of the trend by a market commentator on an end-of-day television program. They would be asked three questions related to expectations about tomorrow's trend.

The three questions were designed to tap expectations in different ways. Specifically, they were:

- 1) *What does the analyst think the market will do tomorrow?*
- 2) *What do people listening to his program guess that the market will do tomorrow?*
- 3) *What do you think the market will do tomorrow?*

All three of questions were answered by rating the expected next-day closing point on a scale relative to the given day's closing point (1=much lower, 4=the same level, 7=much higher). Continuance bias, the primary dependent variable of interest, would appear on this scale as above-midpoint ratings after updays and below-midpoint ratings after downdays. These are distinct, non-synonymous measures of expectancies, so they allow several tests of the hypotheses. By measuring these separately, we can examine whether participants' judgments are driven by their perception of the commentator's views.

All participants saw the same 6 stimulus days, in a different random order for each participant. Trend direction was varied within-groups. Three *uptrend* stimulus patterns were

designed based on randomly selected Nasdaq charts from the prior year, in which there was an appreciable uptrend (between 40 and 80 points). Downtrend versions of each were created by inverting the direction of variation within the given range, and then introducing slight variations early in the day so that the inversion would not be transparent.

The between-groups manipulations were content and format. The commentary content (agent-metaphor, object-metaphor, or no-metaphor) that appeared with each stimulus pattern are listed in Appendix A. The format manipulation held constant the information: in both graphs and tables, price was presented at 15 minute intervals and arrayed along the horizontal axis of the page. An illustration of the varying formats and the commentary content for a given stimulus day is provided by Figure 1.

Results

Hypothesis testing. In order to test our key hypotheses, we began by aggregating across the three stimulus days to reach upday and downday summaries for each rating in each condition. As may be seen in Table 1, participants generally expected continuance after updays (ratings > 4) and after downdays (ratings < 4). To capture a participant's overall tendency to expect continuance, we computed difference scores (upday – downday). As expected, this measure of continuance bias tended to be stronger in the agent-metaphor condition than in the other two conditions (object-metaphor condition and the non-metaphor condition), and these non-agent conditions did not differ from each other.

Hence, to test hypotheses we pooled the two nonagentic conditions for a $2 \times 2 \times 2$ mixed model ANOVA with repeated measures on the Direction factor. That is, we submitted each of the three expectancy ratings to a model that crossed Commentary Content (Between groups: Agentic vs. nonagentic) \times Format (Between groups: Graph vs. table) \times Direction (Within groups:

Up vs. down) model. The only main effect observed that of Direction, which held for the commentator-focused rating $F(1,104)=63.79, p<.001$, the audience-focused rating $F(1,104)=181.63, p<.05$ and the self-focused rating $F(1,104)=45.76, p<.001$. This pattern that ratings were generally higher after updays than downdays suggests that participants generally expected continuance rather than correction.

The influence of agent metaphors. The first hypothesis, that agent metaphors would give rise to increased continuance expectancies, was tested by the Commentary Content \times Direction interaction. That is, agentic descriptions of uptrends were expected to produce an upward bias and agentic descriptions of downtrends were expected to produce a downward bias. This was significant for the commentator-focused rating $F(1,104)=16.06, p<.001$, the audience-focused rating $F(1,104)=4.89, p<.05$, and the self-focused rating $F(1,104)=4.66, p<.05$. Given the larger effect size for the commentator-focused rating, one might wonder whether it mediated the effect on the self-focused rating. We followed the Judd, Kenny, and McClelland (2001) for testing mediation in designs with within-groups variables, which involves regression analysis on the difference scores that collapse the within-groups variable of Direction. Following the standard three steps (Baron & Kenny, 1986), we regressed our proposed mediator (commentator-focused score) and dependent variable (self-focused score) on the independent variables. Commentary content significantly predicted both commentator ($B=-2.00, p<.001$) and self scores ($B=-1.02, p<.001$). We then carried out the third step, regressing the self-focused score on the independent variables while simultaneously controlling for the commentator-focused score. Upon doing so, the previously significant effect of commentary content on self score was reduced to non significance ($B=.207, p=.47$), whereas the putative mediator (i.e., the commentator-focused score) remained significant ($B=.613, p<.001$). A Sobel test confirmed that the effect of metaphor

type on participants' self-focused expectancy score was significantly reduced when their commentator-focused expectancy score was entered into the model ($z=-4.18, p < .001$). This suggests that metaphoric content strongly influenced participants' perception of the commentator's views and this ultimately influenced their own expectancies about the market.

The moderating effect of format. The second hypothesis that the influence of agent metaphors would be diminished when price trend information was presented numerically rather than graphically was tested by the Commentary Content \times Direction \times Format interaction. The interaction effects were directionally present for all three ratings albeit not always reliably: for the commentator-focused rating $F(1,104)=3.56, p<.07$, for the audience-focused rating $F(1,104)=4.89, p<.05$, and for the self-focused rating $F(1,104)= 1.93, p>1.0$. To illustrate the interaction pattern, Figure 2 shows difference scores (collapsing across Direction to measure overall continuance bias) as a function of Commentary Content and Format. Planned contrasts on the difference scores consistently reveal that they are increased by agentic metaphors in the *chart* condition (commentator-focused rating $t(1)=4.57, p<.01$; audience-focused rating $t(1)=3.43, p<.01$; and self-focused ratings $t(1)=2.75, p<.01$), but not the *table* condition (commentator-focused rating $t(1)=1.39, ns$; audience-focused rating $t(1)=0.00, ns$; and self-focused ratings $t(1)=.50, ns$).

Discussion

Study 1 results support our proposal that commentators' metaphorical descriptions influence the investor audience's metaphorical encodings and ensuing judgments. Consistent with the H1, participants exposed to agent-metaphors responded with increased expectancies that today's price trend would continue tomorrow. Moreover, the influence was moderated by the format in which the price trend was presented to participants. Consistent with H2, there was

greater influence in the chart condition, where price trends were presented as spatial trajectories, than in the table condition, where price trends were presented in abstract numbers. The interaction effect is important because it cannot be explained by alternative accounts of the influence of commentary content. For instance, if a participant's response reflected a rational signal-reading process, then it would be present regardless of the format condition.

Given the Study 1 findings that commentators' metaphorical descriptions have consequences for their audience's investment judgments, it is important to know the conditions under which commentators are most likely to generate certain kinds of metaphors. To the extent that particular kinds of price trends evoke agentic language, these would be conditions where investors may be particularly vulnerable to continuance bias.

Study 2

The second study launched our investigation of the antecedent conditions that evoke agent and object metaphors. We left the laboratory to study how real market trends affect real market commentators. Transcripts of an influential end-of-day television program were read in order to extract all references (metaphorical or non-metaphorical) to the day's change in the three major market indices (i.e., Dow, Nasdaq, S&P). We sampled a historical period (January – June 2000) in which indices were volatile but not consistently ascending or descending, hence there were many updays, many downdays, and many sideways days.

We analyzed whether the rates of agent and object metaphors depend on features of the daily price trend, specifically its direction and steadiness. Our hypotheses, to review, were that price gain (versus loss) would be associated with more agent (and less object) metaphors (Hypothesis 3), and that this relationship would be stronger when the directional trend resulted from a steady as opposed to unsteady trajectory (Hypothesis 4). The steadiness of a trend is a

gestalt variable that doesn't correspond precisely to any financial metric; however, one partial measure of steadiness is the price range within the day. To illustrate, when the daily range exceeds the overall rise or gain, this indicates unsteadiness in addition to the overall directional trend.

Method

Procedures. Transcripts of the *CNBC* television program *Business Center* were collected for January through June, 2000. This show aired on weeknights after the close of the financial markets (5 p.m. Eastern Time) and provided a review of the day's market activity.⁷ All sentences or clauses having the Dow, Nasdaq, or S&P index as their subject were extracted for coding, resulting in a list of 1,454 descriptions (roughly four mentions per index per day).

A hypothesis-naïve coder worked with the definitions in Table 2, to code each description into one of three categories: non-metaphorical (N=452), object-metaphor (N=433), and agent-metaphor (N=569). A second research assistant coded half of descriptors to check reliability, yielding a 79% agreement rate.

---insert Table 2 about here---

To compute the criterion variables, the number of agent-, object-, and non-metaphorical descriptions was counted for each of the 3 indexes for each day. Measures of the proportional share of description constituted by agent- and object-metaphors, respectively, were computed by dividing these counts by the total count of descriptions for each index/day.

The predictor variables for trend direction and trend steadiness were computed from the daily price information for each index. Trend direction was measured as the percentage gain--the difference between an index's daily closing price and that of the prior market day, as a percentage of the prior closing value. Uptrends have a positive value and downtrends a negative

value. A measure of trend steadiness was the range (daily high – low) as a percentage of the prior closing value. Range, controlling for the daily gain, picks up the degree to which there were dramatic mid-day movements counter to the main movement of the day.⁸

Results

An overview of the findings can be seen in the correlations between the financial measures of gain and range and the measures of metaphor rates--see Table 3. The overall results, pooling together data from the three market indices, appear in the top two rows. Looking first at the raw count measures of commentary rate, we see that gain has the expected differential relationships to agent-metaphor rate and object-metaphor rate. Range, on the other hand, has a positive relationship to the rate of all kinds of commentary (nonmetaphoric, object metaphor, and agent metaphor), likely reflecting that days with a wider range are simply more newsworthy. Given this pattern, we focused on the proportional measures which tap the relative frequency of particular types of commentary. With the proportion measures, the pattern of associations with gain remain the same--positive with agent metaphors, $r(348)=.27, p < .01$ and negative with object metaphors, $r(348) = -.33, p < .01$. Range, by contrast, is uncorrelated with the proportional rate of agent $r(348) = .05$, and object metaphors $r(348) = .07$. Notice that this configuration of correlations in the overall pooled data is mirrored in the results for each of the indices separately (Nasdaq, Dow, and S&P).

---insert Table 3 about here---

To test hypotheses, the proportional metaphor rates were regressed on measures of trend direction (gain), trend unsteadiness (range), and their interaction. Agent-metaphor rate showed a main effect of trend direction $b=.57, p < .001$; no effect of trend variability $b=.07, p < .10$; and an effect of their interaction $b= -.32, p < .01$; $R^2 = .11, F(3, 344)=13.59, p < .001$. Likewise, object

metaphors showed a main effect of trend direction $b=-8.22$, $p < .001$; no effect of trend variability $b=.08$, $p < .10$; and an effect of their interaction $b= .64$, $p < .001$; $R^2 = .19$, $F(3, 344)=26.46$, $p < .001$. To illustrate the interaction effects, Figure 3 plots metaphor rates for two subgroups—up-days (days that closed more than 1% up) versus down-days (days that closed more than 1% down) as a function of unsteadiness (plotted at 1 SD below and above the mean). As expected, the effect is an attenuation of the difference between up-days versus down-days at higher levels of trend unsteadiness.

Discussion

Study 2 results showed that rates of agent- and object-metaphors in market commentary depend on the overall direction of the daily trend (H3). Also this effect of trend direction was clearer when the trend was steady as opposed to unsteady (H4). Hence the two hypotheses were supported.

However, alternative explanations for the main effect of direction can be raised. A critic might point out that the period sampled directly followed the greatest bull market in history; commentators conditioned by this recent experience may have had bullish expectations. Assuming that commentators have such time-lagged expectations, agent metaphors may have been produced in response to updays simply because these days corresponded to commentators' expectations, not because of anything inherent about upward trends. In our next study we test this argument by sampling a later historical period when time-lagged expectations would have been less bullish than in the period sampled in Study 2.

Study 3

Study 3 replicated the basic method of Study 2. One change was that we sampled a later period when the fresh memories were of *bear* rather than *bull* markets. Rates of the two general

kinds of metaphors were tallied and regressed on the two general measures of price change—direction and steadiness—in order to test our hypotheses as in Study 2.

Additionally, we explored more fine-grained relationships in the dependence of metaphors on trajectories. Agent- and object-metaphors were divided into more fine-grained categories corresponding to frequently used verbs (and their synonyms) such as “climbing,” “struggling,” “falling” and “bouncing.” Also, price trajectories were coded into patterns based on their qualitative shapes on intraday price charts.

Method

Procedures. As in Study 2, electronic transcripts of *CNBC Business Center* were collected, in this case for October 30, 2000 through January 31, 2001. This yielded 774 descriptions of the Nasdaq, Dow, and S&P 500 indices. Gain and range were computed from financial information as general measures of trajectory direction and variability. There was no overall direction of gain or loss in the sample (average daily gain percentage for the three indices was $X = -0.0003$, $SD = 0.0265$, $n = 171$). Descriptions were categorized at the general level as agent-metaphors (268), object-metaphors (150), or non-metaphors (356) by a research assistant. An independent coding by another hypothesis-naïve research assistant on a randomly selected sample of one-fourth of these descriptions showed adequate reliability (84% agreement).

To explore more detailed patterns, the predictor variable of price trajectory was then coded at the level of 8 prototypical trajectory types from intraday price charts of each index (these were collected each business day from www.BigCharts.com, though a few days are missing due to clerical errors). Coders sorted charts into 8 categories relying on a verbal definition as well as sketches of stylized prototypes. Charts showing a salient price change were categorized in terms of direction and steadiness, resulting in the categories of steady upwards,

unsteady upwards, steady downwards, and unsteady downwards (these four types are the upper panel of Table 4). Charts without a salient directional change were categorized into four types (showing in the lower panel of Table 4): calm (a relatively flat trend), chaotic (a trend with swings in both directions), fall-and-rise (a trend with one salient valley), and rise-and-fall (a trend with one salient peak). An independent hypothesis-naïve coder coded a randomly selected third of the charts, and the reliability was adequate ($\kappa=.76$).

--insert Table 4 about here

The criterion measures of metaphor rate were also coded at a more fine-grained level—subtypes of verbs rather than the general agent versus object categories. Metaphoric descriptions were tallied in terms of an emergent coding scheme developed to capture different subtypes of agent and object metaphors. Each description was coded as to which of the following verbs it most closely resembled: jumped, climbed, struggled, rallied, followed, tested, edged, recovered, fell, slipped, tumbled, skidded, bounced, and reversed. An independent coding by another hypothesis-naïve research assistant on half the descriptions showed adequate reliability ($\kappa = .82$).

Results

The first purpose of Study 3 was to check whether the results of Study 2 could be replicated in a different historical period. To this end, measures of the proportional rate of agent and object metaphors were regressed on gain, range, and their interaction. For agent metaphors, there was as expected an effect of gain, $b=.33$, $p < .05$; no effect of range gain, $b=.439$, $p > .10$; and the interaction effect fell short of significance, $b=-.23$, $p > .10$; $R^2=.035$, $F(2,167)=2.03$, $p=.112$. For object metaphors, results showed the expected an effect of gain, $b=-.62$, $p < .01$; no effect of range, $b=-.04$, $p > .10$; $R^2=.126$, $F(3,167)=8.06$, $p < .01$; and the expected interaction

effect $b=.414$, $p<.01$. In sum, there was strong support for the main effect and mixed support for the interaction effect hypotheses.

We also explored the relationship between price trajectories and metaphorical verbs at a more fine grained level. Table 4 shows the most prevalent verbs evoked by each of the 8 trajectory types. In the top panel, many of the most prevalent verbs are identical to those in the *WSJ* descriptions of major uptrends and downtrends that we listed from Andreassen's (1987, pilot study) data. These involve two types—actions by an agent (“jumped” and “climbed”) and object movements dictated by external forces such as gravity and resistance (“fell” and “dropped”). Not surprisingly, different verbs are evoked by the sideways trends in the lower panel, which seem to express primarily horizontal movement (e.g. “edged” or “skidded”). Another type in both panels seem to be verbs that describe tension between an agent's internal goals and external forces (e.g. “struggled” and “rallied”). Though the Ns are too small for significance testing, these seem to be evoked by unsteady trajectories.

Discussion

Study 3 replicated the key main effect, that price gain is associated positively with agent-causality metaphors and negatively with object-causality metaphors. The fact that these results were replicated in a historical period following a sustained market downturn weighs against the alternative account in terms of commentators' bullish expectations. However, another alternative account could still be posited. If commentators generally wish for uptrends, they may be motivated to expect continuance after updays but not downdays.⁹ If so, their penchant for agentic interpretations of uptrends (and not downtrends) may reflect motivated reasoning (Kunda, 1990) rather than the trajectory-triggered schemas. Our next study investigates this by manipulating whether commentators have a motive for upward versus downward trends.

Finally, the predicted interaction-effect fell short of significance on one of the two metaphor rate measures. The mixed results may reflect the fact that our operationalization (range) captures only one component of trend steadiness. In our next study, we directly manipulate trend steadiness (as well as trend direction) in a laboratory experiment. This should allow a much clearer identification of the effects.

Study 4

Our final study was a laboratory experiment that put participants in the role of stock market commentators. They were shown a series of stock charts. Participants were asked to describe each day's activity into a microphone. Their commentary was transcribed and its metaphorical content was coded. Another measure of their metaphoric thinking came from ratings participants made after commenting on the series of charts. They were shown each chart again and asked to rate the extent to which particular metaphorical phrases fit their description of the trend. For all of the charts, participants rated the extent to which their description was agentic. Additionally, participants rated the similarity of their commentary to several phrases, different sets for updays and downdays. Some were designed to follow up the hints in Study 3 that different kinds of verb types are evoked by steady and unsteady trajectories.

Trend direction and steadiness were varied as within-groups manipulations. In addition, there was a between-groups manipulation of whether uptrends were presented as desirable for the participants or not. This was achieved by varying the description of the market index represented in the charts, such that uptrends represented a positive or negative development. Participants were college students in the Silicon Valley region of California. In the uptrend-motive condition, the charts were billed as the Nasdaq index, and this was described as an indicator of the local job market. In the downtrend-motive condition, the charts were billed as the

“California Energy Futures index,” and this was described as an indicator of the electricity blackouts that had been recently affecting the region (in Spring 2001). This manipulation of whether uptrends served the interests of participants allowed us to test the role of motivated reasoning in agentic description. If the tendency to describe uptrends as agentic is a matter of wishful thinking, then it should occur in the uptrend-motive condition but not the downtrend-motive condition.

Method

Participants. Participants were 70 undergraduates at Stanford University recruited by an offer of \$10 to participate in a half-hour study concerning judgments about financial markets. Advertisements emphasized that no expertise with financial markets was required.

Procedure. Participants were told that they would be shown charts of the intraday activity of a market index. The cover story describing the market index was varied between-groups to manipulate motives for uptrends. In the uptrend-motive condition, participants were told they would see charts of the Nasdaq index, an indicator of the local (Silicon Valley) job market. In the downtrend-motive condition, participants were told they would see charts of the “California Energy Futures Index” index, an indicator of the energy shortages and blackouts that had been recently hindering the region. Participants, who were run individually, were queried verbally to make sure that they understood the manipulation, and showed an understanding that uptrends had different hedonic consequences in the two conditions.

The charts were presented to participants in booklets with a separate page for each chart. Charts were labeled on the y-axis in terms of percent gain or loss and on the x-axis in terms of half-hours from 9:30am to 4:00pm. The charts were enumerated cryptically (e.g. Day #112, Day #37) and randomly ordered. The 5 charts were designed to represent the trend prototypes that we

referred to in the preceding study as steady-uptrend, unsteady-uptrend, steady-downtrend, unsteady downtrend, and chaotic. The goal was to test hypotheses concerning direction and variability, and the chaotic pattern was included as filler. The four focal charts were created by starting with graphs of steady and unsteady decreases, then creating mirror images, and then slightly adjusting the mirror images so that the reversal was not obvious. The 5 were put in a random ordering: Half of subjects saw the graphs in this order and half in the reverse of this order. Upon being presented with the booklet, subjects were asked to read the following instructions, which appeared on the cover-sheet of the booklet:

These are charts of the Nasdaq (Energy-Futures) index activity on 5 days we've selected. For each chart we want you to give an off-the-cuff description or interpretation of the activity, as though you were describing it on the phone at the end of the day to a group of friends.

Participants were then given a few minutes to study each chart, after which they spoke their description into a microphone. These descriptions were tape recorded, so that they could be later transcribed and content analyzed.

Once participants had finished describing the market activity for the five days, they were given a questionnaire. On its 5 pages the graphs were repeated, along with several verb phrases describing the market index's activity. Participants were told that their task was to rate the extent to which each captured their interpretation of the activity. Most important was a rating of agentic impression; the extent to which the market *was trying to do something*.

Also there were specific items that varied for uptrends as opposed to downtrends. These were used to explore whether steadiness affects the metaphor subtypes evoked. The uptrend list included two of the most prevalent uptrend verbs from Study 3, "jumped" and "climbed." Also

we included one expected to be triggered with steady uptrends, “thrust,” and one expected to be triggered with unsteady uptrends, “wandered.” Likewise, the downtrend list included two prevalent verbs from Study 3, “fell” and “tumbled,” as well as one expected with steady downtrends, “dove,” and one expected with unsteady downtrends, “searched.” Participants rated the extent to which each phrase resembled their interpretations on a 7-point scale (1=not at all; 7=very much).

Content analysis. Tapes of participants’ market commentary were transcribed. The overall description of each price chart was rated by two hypothesis-naïve graduate student coders on several abstract dimensions. Coders worked with the paragraph-long transcriptions for each day’s description, without seeing the original charts. Unlike the pithy phrases of market journalists (“the Nasdaq jumped mid-day”), participants rambled on in adjectives and similes (e.g. “in the morning the Nasdaq was mellow but then started some crazy surges...”). To assess agentic description, coders rated the extent to which the market movement was described as active and internally-driven. The agentic pole of the scale was illustrated by “the market climbed upwards,” whereas the nonagentic pole was illustrated by “the market was swept upwards.” Also, to check an alternative account, coders rated the degree to which the market movement was described as dramatic or extreme.

Results

There were two sets of dependent measures—transcript codings and participants’ scale-ratings. The hypotheses were tested in a MANOVA with Direction (2: uptrend, downtrend) and Steadiness (2: steady, unsteady) as within-participants factors and Motive (2: uptrend-motive, downtrend-motive) as a between-participants factor. Overall, the results paralleled those in Studies 2 and 3. There was a main effect of Direction and an interaction effect of Direction ×

Steadiness. Moreover, no there were no effects of the Motive manipulation.

The coded measures may be seen in Table 5. For agentic description, there was a main effect of Direction, $F(1,56)=41.91, p<.001$, reflecting more agentic description of uptrends $M=2.73$ than downtrends $M=1.43$. Agentic description also showed an interaction of Direction \times Steadiness. $F(1,56)=10.05, p<.005$, reflecting that the difference between uptrends and downtrends was attenuated in the unsteady conditions relative to steady conditions. For dramatic description, there were no effects of Direction, Steadiness, or their interaction. This suggests that the effects on agentic descriptions are not simply a function of which trajectories appear to be dramatic trends to the commentators.

Turning to the scale-rating measures, the most important one was a general measure of agentic description. There was a main effect of Direction, $F(1,56)=41.91, p<.001$, and an interaction of Direction \times Variability, $F(1,56)=10.05, p<.005$. The MANOVA means are plotted in Figure 4. Again we see that uptrends were described more agenticly than downtrends and this effect was attenuated under the condition of unsteadiness.

In addition to testing our hypotheses about general trajectory cues and agentic description, we also explored patterns at a more fine-grained level by asking participants to rate the extent to which several specific verbs corresponded to their description. The means from these ratings may be seen in Table 6. For updays, “jumped” was endorsed equally for the two trend directions. “Climbed” was rated higher for unsteady than steady trends, perhaps because it calls to mind traversing an uneven surface. As expected, “thrusted” upward was endorsed more for the steady trend and “wandered” upward for the unsteady trend. For downdays, “fell” was endorsed more for steady trends but “tumbled” was not. As expected, “dove” was endorsed more for the steady trend and “searched” for the unsteady trend. In sum, these exploratory results

suggest that people endorse different verbs for steady as opposed to unsteady trends.

Discussion

Results of Study 4 supported our hypotheses about the preconditions of agent metaphors. Coded measures from transcripts and participants' scale ratings showed the predicted main effect of trend Direction and the predicted Direction \times Steadiness interaction effect. These laboratory findings complement the early findings from archival analysis of field data.

Also Study 4 results ruled out two alternative explanations: that agentic descriptions are evoked by trends congruent with motives, and that agentic description are evoked by trends that are perceived to be dramatic. An experimental manipulation of motives had no effect on the rate of agentic description. A measure of dramatic description did not show effects parallel to the measure of agentic description.

Finally, Study 4 explored differences in the verbs preferred for steady versus unsteady trends. The findings fit our intuitive predictions about verbs that fit steady versus unsteady downtrends and uptrends. Compared with steady trends, unsteady trends may be more likely to evoke agentic verbs that posit complex forces or tensions between forces. Yet our findings are merely suggestive; a systematic analysis of the verb subtypes associated with steady and unsteady trajectories is a project for future research.

General Discussion

In four studies we have found support for our hypotheses concerning consequences and preconditions of metaphors in stock commentary. Study 1 found, consistent with H1, that agent-metaphor commentary increased investor expectancies of trend continuance. Further, consistent with H2, the influence was stronger when price information was presented in chart rather than table format. Although alternative accounts may be posited for the main effect of commentary

content, only the metaphorical encoding account can explain why the influence is stronger in the graph than table condition.

The preconditions we investigated were the price trajectories that commentators had to describe. Consistent with H3, we found that agent metaphors occur more frequently in descriptions of updays than downdays. This held in an analysis of CNBC transcripts from two time periods, following a bull market (Study 2) and a bear market period (Study 3). It also held in an experiment that measured commentaries of laboratory participants in response to manipulated trajectories (Study 4).

Finally there was mixed evidence for H4, that the effect of direction would be attenuated when the trend is unsteady as opposed to steady. Unsteady trajectories include minor movements opposite to the overall direction and hence send a mixed signal about animacy. Support for this interaction effect was attained in our CNBC studies (Study 2 and 3), significantly so in three of four tests. The laboratory experiment (Study 4) used a more direct manipulation of trend steadiness and found the predicted interaction effect on both transcript-coded and self-rated measures of agentic interpretation (Study 4).

Overall, the current studies found strong evidence for the main effect hypotheses (H1 and H3). The evidence for the interaction effect hypotheses (H2 and H4) was less consistent across measures. To fully understand the issue of boundary conditions on metaphoric encoding (H2), future studies could investigate the effects of other price trend information formats. Similarly, to fully understand the issue of trend unsteadiness as a trigger to schemas and associated metaphors, future experiments could compare different kinds of unsteadiness to see which of them is most crucial in moderating the effect of direction.

Implications

Metaphors in cognition and communication. The current findings contribute to research on “metaphors we live by,” conventional metaphors that are used in everyday cognition and communication about abstract topics (Lakoff, 1993). We have gone beyond the prior informal studies of the metaphors that stock commentators live by (Schmidt, 2002) in that we have identified regularities in the financial conditions that evoke particular types of metaphors from commentators. Not only is the first study to identify the eliciting conditions for stock market metaphors, it is one of few studies of metaphors in any domain that empirically tests hypotheses about the conditions that evoke metaphors. Using multiple studies with complementary methods, we have documented that agent metaphor description occurs more frequently for updays than downdays, as follows from our account in terms of the trajectory features that trigger causal schemas.

Our studies rule out a number of alternative explanations that might be generated for this main effect, such as that uptrends are more expected, more desired, or more dramatic in the eyes of commentators. Nor is it the case that all metaphor types increase with uptrends; as we hypothesized, the rate of object metaphors declines. Also we found the predicted interaction-effect, reflecting that unambiguous steady uptrends and downtrends have the sharpest effect in triggering agent and object metaphors respectively.

Research on embodied cognition increasingly finds that people’s thoughts about abstract topics make use of schemas with perceptual content (Barsalou, 1999). The current research supports the broader argument that metaphoric processing draws on core domains of innate schemas. Dennett (1995) argues that it is by only recycling perceptual schemas that humans overcome the “representational bottlenecks” that otherwise limit our thinking. Psychological and anthropological theorists (Boyer, 2000; Wegner, 2002) have argued that agent schemas (or

“theories of person”) underlie reasoning about many complex systems, such as the weather, the supernatural, or computers. The evidence for most of these claims, however, is merely suggestive. The current studies add to the evidence that agent schemas are drawn upon in the metaphorical processing of abstract events.

Not only have we advanced the evidence for metaphoric processing by identifying consequences and preconditions, but we have studied it in a new domain—the stock market. Compared to previously studied domains, such as love (Gibbs, 1992), the stock market is one where professional communicators strive for dry precision rather than inspiring poetry, so it is striking that metaphoric description is so prevalent in stock commentary. The current findings comport with some other recent evidence that investors think about stock market investments in intuitive, qualitative terms. MacGregor, Slovic, Dreman, and Berry (2000) studied individual differences in the thematic images that investors associate to different market sectors (e.g. “strong” versus “weak”), finding that these qualitative associations predict their willingness to invest even after their quantitative assumptions are taken into account. Our results suggest that one source of these anthropomorphic associations may be metaphoric interpretation of price trends.

Investor judgment. The current research also contributes to the literature examining the content of stock market commentary and its influence on investor judgment. Andreassen (1987) found that pairing price change with explanatory references to news about business conditions leads investors to expect continuance. DiFonzo and Bordia (1997, 2002) showed the same effect with explanatory references to rumors. The current findings are more surprising in that expectancies are conveyed even when commentators have made no explanatory reference to business conditions. Commentators merely use metaphoric language to describe price trends and

causal expectancies are evoked. By positing the common mechanism of agent schemas, the current research relates biases in the investment domain with those in the social and sports domain.

Behavioral economics research has investigated whether investors over-react to trends by expecting too much continuance or under-react too little. There is economic evidence from some markets that investors show an over-reaction bias (Offerman & Sonnemans, 2004). Yet there is also, in other cases, evidence for an under-reaction bias (Forbes, 1996). The current research suggests that over-reaction can depend on metaphoric interpretation of trends, and so this may help to distinguish when each kind of bias occurs.

Limitations

The current studies leave some open questions that are worth reviewing. Do metaphors in commentary affect expert investors as much as novices? Expert investors, who hold sharp conceptions of the market based on economic principles, may have an easier time screening out images agentic or physical events than novice investors, whose model of the market is less developed. Comprehending others' metaphors requires cognitive strategies for "inhibition of the literal" (Galinsky & Glucksberg, 2000). This suggests that the costs of media metaphors may be borne chiefly by the investors on "Main Street" rather than those on Wall Street. Yet given that even trained investors do think qualitatively about investments (MacGregor, et al, 2000), it is a question that that can only be answered empirically.

Related to the first issue is the larger question of how media metaphors ultimately affect stock prices. One possibility is that investors may be led to believe uptrends are meaningful signals whereas downtrends are not. That is, updays are more likely to be described agenticly, and agentic descriptions then foster expectancies of continuance. Schiller (2000) argues that the

late 1990s stock market bubble came as media commentary (through channels such as CNBC) became more pervasive than ever before and more investors than ever before made their trading decisions (Schiller, 2000).

However, the matter is undoubtedly more complex because of other biases that operate simultaneously. Research on the “disposition effect” shows that people have a reluctance to sell “losing” stocks but not “winning” stocks. Weber and Camerer (1988) conducted experiments to test that this comes from investors using their purchase price as a reference point and gambling on losses while avoiding risk on gains. Their results did not support an alternative interpretation that investors expect winning stocks to falter. This suggests that expectancies of uptrends do not necessarily beget buy decisions. The disposition effect phenomena may mitigate some consequences of the continuance bias. Future research is needed to fully understand how expectancies of trends affect decision making.

Related Issues for Future Research

The current research spurs a number of questions that fall outside of the current hypotheses yet would be worthy topics for future research.

Subtypes of Metaphors. In the current studies 3 and 4, there are findings that suggest that there may be more fine-grained associations between trajectory types and metaphor types. Our hypotheses focused on the basic distinction between agent and object schemas, but there is evidence that agentic schemas are organized into subtypes (Morris & Murphy, 1990; Wellman, 1990). Future research will have to identify subtype distinctions are relevant to trajectories, perhaps drawing on analyses of force dynamics in verbs (Talmy, 1985).

Another issue is whether there are subtypes with different implications about trend continuance. Most agency schemas imply an enduring goal (“The Nasdaq fought its way

higher”), yet some subtypes may imply goal fulfillment (“The Nasdaq reached its yearly high”) and hence may not give rise to expectancies of trend continuance. Some object-causality subtypes may imply continuance, such as schemas for objects moving with a high degree of momentum (McCloskey & Kohl, 1983). Object causality schemas that imply momentum may give rise to expectancies of trend continuance.

Metaphors and Financial Advice. If the metaphors we have identified are truly pervasive, then we might expect that they have permeated paradigms of investing advice. A couple of examples suggest that these traditions of communicating about the market have hit upon agent and object schemas and their connections to trajectories. As a first example, consider the expression in which a small uptrend after a long downtrend is called a “dead cat bounce” (as in, even a dead cat would bounce if you dropped it from that height!). This expression applies an object causality schema (a dead cat) that stands in implicit contrast to an agent causality schema (a live cat). In this way, the expression may play off of the audience’s categories in order to drive home the point that trend continuance should not be expected.

More broadly, a connection can be drawn to the “chartist” approach to investing, often called “technical analysis,” which has a continuing popular appeal despite the dearth of economic evidence for its validity. Chartists look for patterns in stock charts (e.g. “a candlestick”) that portend future price trends (see Smith, 1999). The intuitive plausibility of this approach may owe something to the fact that our brains are hardwired to extract meaning from trajectories in other domains.

As a final example, let us consider the quite different approach of contrarian value investing is advocated in Graham’s classic (1959) *The Intelligent Investor*. Graham’s strategy in persuading the reader may be another example of playing off of the intuitive tendency of agentic

interpretation. Rather than banishing anthropomorphism, Graham encourages the reader to think of the stock market as a person, but a particular type of person, a manic-depressive whose behavior cannot be predicted from one day to the next:

Mr. Market comes to your door every day with an offer to sell a company, sometimes Mr. Market is manic and he asks far more than it is worth; sometimes he is depressed and asks far less than it is worth.

Research on de-biasing finds that people benefit more from training rules framed in terms of everyday causal schemas than abstract statistical concepts such as the random walk (Morris & Nisbett, 1993). Graham's book takes exactly this approach to teaching people to avoid the continuance bias.

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Footnotes

2

Why do people have this bias if it leads to biased predictions? It may be that attributing properties of persons is necessary for navigating the social world, and hence it becomes habitual from a young age, even though it leads to errors in many situations where others' behavior does not primarily reflect their internal properties. Another answer, from evolutionary psychology, is that many schemas are hardwired into the brain because they were adaptive in the so-called environment of evolutionary adaptedness that existed throughout the Pleistocene era (Pinker, 1997). Attributing agency to predict future behavior may have been enhanced survival chances in this environment, and thus become evolved as an automatic response, even if the modern world presents many situations in which the resulting bias is problematic.

⁴ Frog evolution “designed” its flytrap to detect features of fly trajectory, rather than color, size, or shape, because the trajectory feature is more useful in distinguishing flies from non-flies. At least this is true in the frog's natural ecology; in Lettvin's lab, by contrast, frogs lap in vain at abstract displays. As we shall see, people making sense of stock charts may be in a predicament something like that of the frogs in Lettvin's lab, victims of their automatized responses to trajectory cues.

⁵ It is worth clarifying, that metaphors of either sort are logically possible regardless of direction. An uptrend could be encoded as a climbing hiker (agent) or as a leaf blowing in the wind (object); a downtrend could be seen as a diving raptor (agent) or a tumbling boulder (object). Yet *psychologically*, agent metaphors should be evoked by uptrends and object metaphors by downtrends.

⁶ Three major indices dominate descriptions of market activity: the Dow (the Dow Jones Industrial Average, a price-weighted average of 30 major stocks traded on the New York Stock Exchange and the Nasdaq), the Nasdaq (over 4,000 stocks traded on the Nasdaq exchange, featuring many technology and Internet-related companies), and the S&P 500 (500 stocks covering all major areas of the U.S. economy, also known as “the S&P”).

⁷ The network described the daily show as, “CNBC’s signature evening business newscast live from the floor of the New York Stock Exchange. ‘Business Center’ co-anchors Sue Herera and Ron Insana report on breaking news, the latest trends influencing the global economy and review the day’s top business and financial headlines ...”The show’s anchors and reporters described each day’s market activity, including discussion of individual stocks as well as the major market indices.

⁸ Admittedly, it does not capture all the aspects of unsteadiness that a perceiver might notice, such as the number of directional shifts. We will work toward more complete measures in subsequent studies.

⁹ It’s not clear why commentators’ would have such a motive; many of their constituents are investors who hope to buy on downturns or to collect on “short” bets on market decreases.

Table 1

Ratings of Next Day Closing Price as a Function of Direction, Metaphor, and Format

Conditions (Study 1).

	Mean Ratings				<u>Difference Score</u>	
	<u>Up Days</u>		<u>Down Days</u>		<u>Chart</u>	<u>Table</u>
	Chart	Table	Chart	Table		
Expectancy ratings:						
<u>Commentator-focused</u>						
Agent Metaphor	5.32	5.00	2.81	3.42	2.51*	1.58*
Object Metaphor	4.33	4.56	3.80	3.67	.53	.89
No Metaphor	4.30	4.58	3.83	3.76	.47	.82*
<u>Audience-focused</u>						
Agent Metaphor	5.57	5.08	2.26	3.13	3.11*	1.95*
Object Metaphor	4.87	4.91	3.06	2.71	1.81*	2.20*
No Metaphor	4.69*	4.73	3.12	3.02	1.57*	1.71*
<u>Self-focused</u>						
Agent Metaphor	4.73	4.71	3.22	3.64	1.51*	1.05*
Object Metaphor	4.28	4.35	3.73	3.60	.55	.75
No Metaphor	4.37	4.53	3.95	3.60	.42	.93*

Note. Cells show Means (SD's). Ratings > 4 indicate expected uptrends; ratings < 4 indicate expected downtrends. Asterisks in difference score column indicate scores significantly different from 0.

Table 2
Content Analysis Coding Scheme (Study 2)

<u>Category</u>	<u>Description</u>	<u>Examples</u>
Non- metaphorical	Describes price change as increase/decrease or as closing up/down	The Dow today <u>ended</u> down almost 165 points, or 1 1/2 percent (May 17, 2000)
Object- causality Metaphors	Describes movement as trajectory of an object affected by mechanical forces such as gravity, resistance, external pressures	And as for the S&P 500, it also <u>got caught in the downdraft</u> . (February 25, 2000)
Agent- causality Metaphors	Describes movement as an self-propelled action with or without reference to goals	The NASDAQ index <u>jumped</u> 122 1/3rd points. (February 10, 2000)

Table 3

Correlations of Financial Measures with Rates of Metaphoric Commentary (Study 2).

	<u>Count Measures</u>			<u>Proportion Measures</u>		
	Description Type			Description Type		
	Non-Metaphor	Object Metaphor	Agent Metaphor	Non-Metaphor	Object Metaphor	Agent Metaphor
<i>Overall</i> (<i>n</i> =348)						
<i>Gain</i>	.03	-.24**	.19**	.07	-.33**	.27**
<i>Range</i>	.18**	.33**	.32**	-.11*	.07	.05
<i>Nasdaq</i> (<i>n</i> =121)						
<i>Gain</i>	-.03	-.28**	.19*	.01	-.30**	.31**
<i>Range</i>	.20*	.24**	.18*	.01	.02	-.03
<i>Dow</i> (<i>n</i> =120)						
<i>Gain</i>	.08	-.14	.27**	.06	-.32**	.24
<i>Range</i>	.03	.23*	.27**	-.15	.12	.05
<i>S&P</i> (<i>n</i> =107)						
<i>Gain</i>	.24*	-.50**	.27**	.21*	-.51**	.34**
<i>Range</i>	.02	.02	.13	-.02	-.03	.05

Note: * $p < .05$. ** $p < .01$. Gain measures trend direction and range measures trend variability.

Table 4
*Most Frequent Verb Phrases Evoked as a Function of Coded Trajectory Patterns
 (Study 3).*

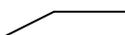
<i>Price-Change Patterns</i> (n=92)	Visual Prototype	<u>1st</u>	<u>2nd</u>	<u>3rd</u>
Steady Uptrend		Jumped 12.4 %	Climbed 10.0 %	Recovered 5.2 %
Unsteady Uptrend		Climbed 9.9 %	Jumped 8.1 %	Rallied 7.6 %
Steady Downtrend		Fell 31.4 %	Tumbled 16.0 %	Slipped 2.4 %
Unsteady Downtrend		Fell 21.0 %	Tumbled 12.5 %	Struggled 4.7 %
<i>Non-Change Patterns</i> (n=92)				
Calm		Slipped 30.0 %	Followed 11.1 %	Climbed 11.1 %
Chaotic		Fell 10.7 %	Edged 9.8 %	Struggled 7.2 %
Fall-and-rise		Skidded 10.0 %	Fell 8.6 %	Bounced 7.1 %
Rise-and-fall		Slipped 12.0 %	Edged 7.6 %	Jumped 6.0 %

Table 5

Transcript Codings as a Function of Trend Direction, Steadiness, and Motive condition (Study 4).

Agentic Description

	<u>Uptrend</u>		<u>Downtrend</u>	
	Steady	Unsteady	Steady	Unsteady
<u>Motive:</u>				
<u>Uptrend wanted</u> ("Nasdaq Index") N=39	2.94	2.71	1.29	1.63
<u>Downtrend wanted</u> ("Energy Futures Index") N=19	2.67	2.39	1.28	1.50

Dramatic Description

	<u>Uptrend</u>		<u>Downtrend</u>	
	Steady	Unsteady	Steady	Unsteady
<u>Motivation Manipulation</u>				
<u>Uptrend wanted</u> ("Nasdaq Index") N=39	3.37	3.37	3.54	3.29
<u>Downtrend wanted</u> ("Energy Futures Index") N=19	3.22	3.28	3.22	3.78

Table 6
Endorsement of Verbs as a Function of Trend Variability (Study 4).

	Trend Steadiness	
	Steady	Unsteady
Uptrend Verbs		
Jumped	3.09	3.00
Climbed	3.43	4.29***
Thrust	5.56	4.72***
Wandered	3.03	3.71**
Downtrend Verbs		
Fell	3.15	2.24***
Tumbled	3.48	3.34
Dove	3.22	2.65***
Searched	2.22	2.74***

Figures

Figure 1
Illustration of Format Manipulation and Commentary Manipulations (Price Information and Accompanying Commentary for Uptrend Version of Stimulus Pattern 1)

Chart format

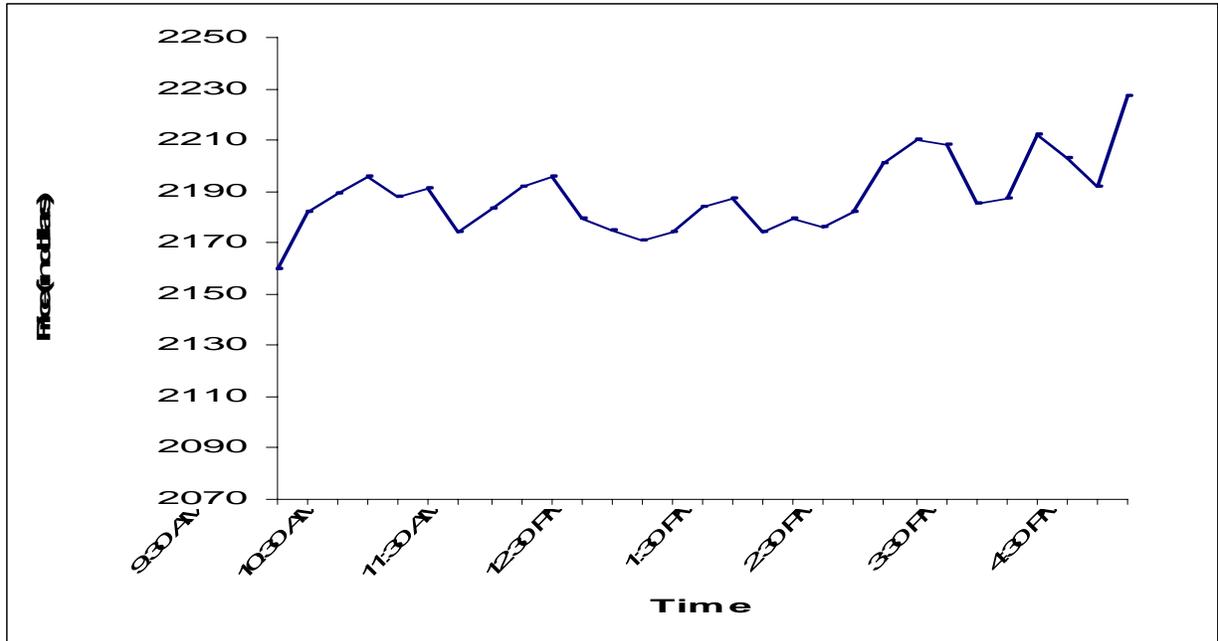
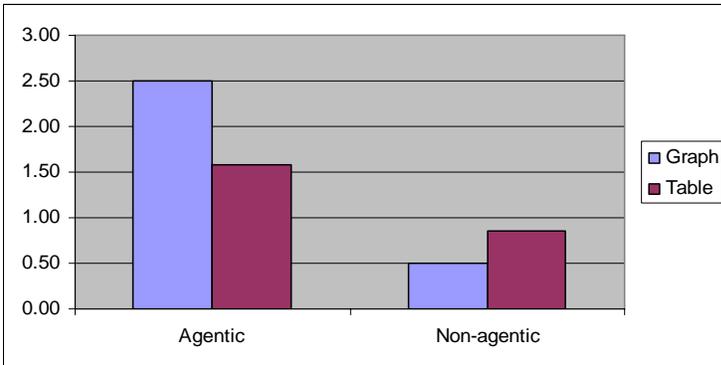


Table format (only half day shown)

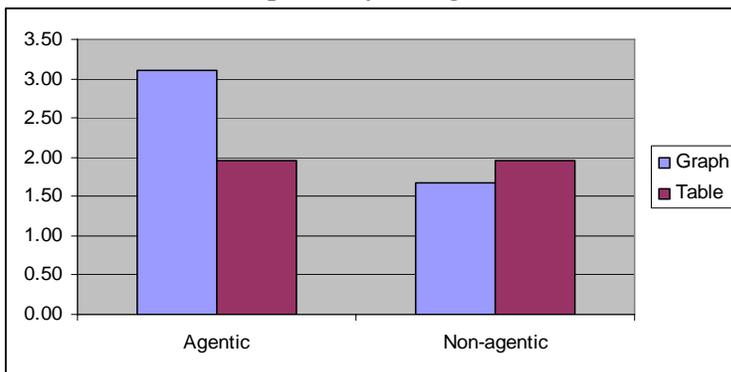
9:30 AM	9:45 AM	10:00 AM	10:15 AM	10:30 AM	10:45 AM	11:00 AM	11:15 AM	11:30 AM	11:45 AM	12:00 PM	12:15 PM	12:30 PM	12:45 PM	1:00 PM
2160	2182	2189	2196	2188	2191	2174	2183	2192	2196	2179	2175	2171	2174	2184

Figure 2
The Interactive Effect of Commentary Content and Information Format (Study 1)

Commentator-focused expectancy rating



Audience-focused expectancy rating



Self-focused expectancy rating

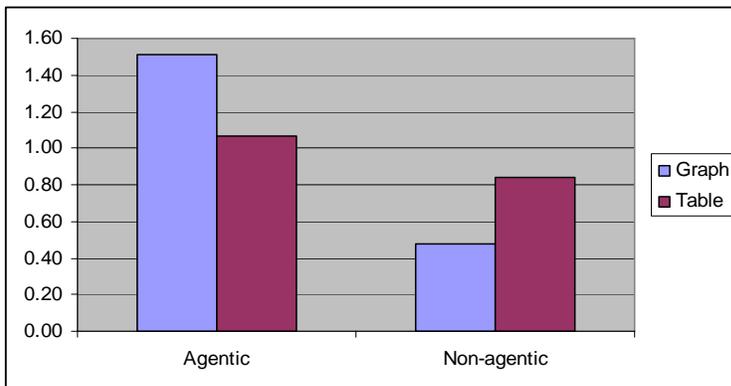


Figure 3
The Interactive Effect of Trend Direction and Trend Steadiness (Study 2)

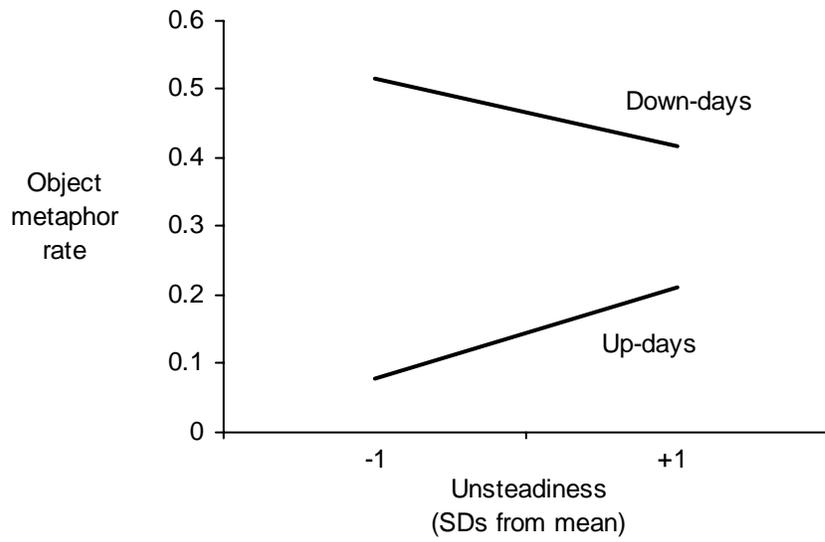
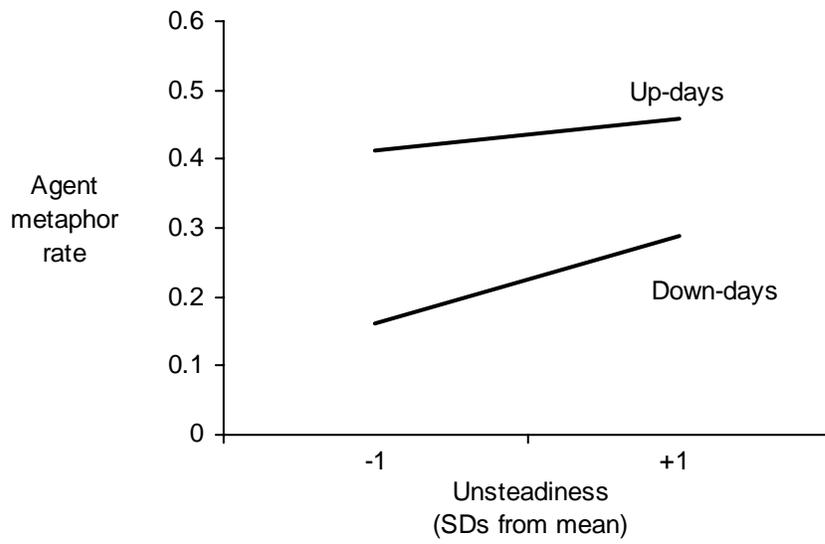
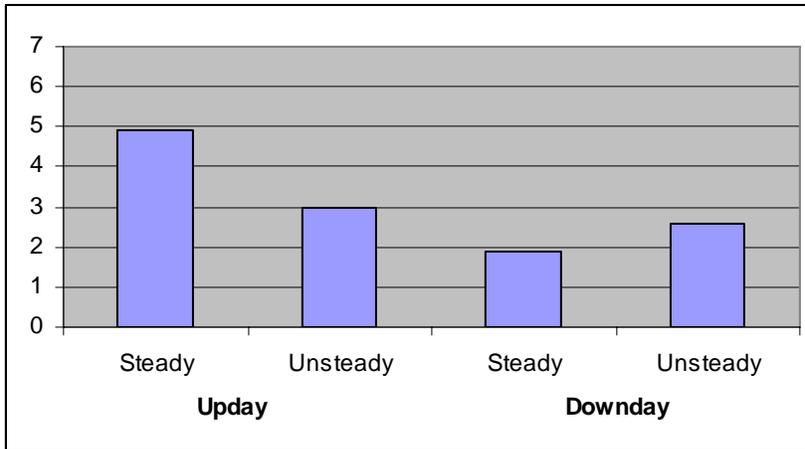


Figure 4
Rated Endorsement of Agentic Description as a Function of Trend Direction and Steadiness
(Study 4).



Appendix A
Sets of Market Commentary Used in Study 1

Stimulus pattern	Direction	Metaphor ?	Analyst Commentary
<u>Item 1</u>	Up1	Agent Object None	This afternoon the Nasdaq started climbing upwards. This afternoon the Nasdaq was swept upward. This afternoon the Nasdaq index posted a gain
	Down1	Agent Object None	This afternoon the Nasdaq started climbing downwards. This afternoon the Nasdaq was swept downward. This afternoon the Nasdaq index posted a loss.
<u>Item 2</u>	Up2	Agent Object None	Today the Nasdaq leaped and bounded higher. After ricocheting back and forth all morning, the Nasdaq bounced higher. Today the Nasdaq index showed increases near the close of the trading session.
	Down2	Agent Object None	Today the Nasdaq leaped and bounded lower. After ricocheting back and forth all morning, the Nasdaq bounced lower. Today the Nasdaq index showed decreases near the close of the trading session.
<u>Item 3</u>	Up3	Agent Object None	After a mixed morning the Nasdaq broke free and headed higher. Today the Nasdaq drifted higher. After volatility in the morning the Nasdaq index ended higher.
	Down3	Agent Object None	After a mixed morning the Nasdaq broke free and headed lower. Today the Nasdaq drifted lower. After volatility in the morning the Nasdaq index ended lower.
